56. (NEW) A nucleic acid oligomer modified by covalently attaching a redox-active moiety, wherein the redox-active moiety comprises at least one electron-donor molecule and at least one electron-acceptor molecule, the electron-donor molecule and electron-acceptor molecule not being joined with one another by nucleic acid oligomers.

57. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety comprises at least one redox-active, linked, to at least one bimolecular electron-donor/electron-acceptor complex, at least one electron-donor molecule of the redox-active moiety and at least one electron-acceptor molecule of the redox-active moiety being joined with one another via one or more bonds.

58. (NEW) The modified nucleic acid oligomer according to claim 57, wherein the bonds are covalent bonds.

59. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety comprises at least one redox-active, linked, to at least one bimolecular electron-donor/electron-acceptor complex, at least one electron-donor molecule of the redox-active moiety and at least one electron-acceptor molecule of the redox-active moiety being covalently joined via one or more branched or linear molecular moieties of any composition and chain length.

60. (NEW) The modified nucleic acid oligomer according to claim 59, wherein the branched or linear molecular moieties have a chain length of 1 – 20 atoms.

61. (NEW) The modified nucleic acid oligomer according to claim 59, wherein the branched or linear molecular moieties have a chain length of 1-14 atoms.

62. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety additionally comprises one or more macromolecules.

63. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety is the native or modified reaction center of photosynthesizing organisms.

64. (NEW) The modified nucleic acid oligomer according to claim 63, wherein the redox-active moiety is the native or modified reaction center of photosynthesizing bacteria.

65. (NEW) The modified nucleic acid oligomer according to claim 56, wherein at least one of the electron-donor molecules and electron-acceptor molecules is a pigment.

66. (NEW) The modified nucleic acid oligomer according to claim 65, wherein the pigment is a flavin, a (metallo)porphyrin, a (metallo)chlorophyll, a (metallo)bacteriochlorophyll, or a derivative of these pigments.

67. (NEW) The modified nucleic acid oligomer according to claim 56, wherein at least one of the electron-donor molecules and electron-acceptor molecules is a nicotinamide or a quinone.

68. (NEW) The modified nucleic acid oligomer according to claim 67, wherein the quinone is a pyrroloquinoline quinone (PQQ), a 1,2-benzoquinone, a 1,4-benzoquinone, a 1,2-naphthoquinone, a 1,4-naphthoquinone, a 9,10-anthraquinone, or one of their derivatives.

69. (NEW) The modified nucleic acid oligomer according to claim 56, wherein at least one of the electron-donor molecules and electron-acceptor molecules is a charge transfer complex.

70. (NEW) The modified nucleic acid oligomer according to claim 69, wherein the charge transfer complex is a transition metal complex.

71. (NEW) The modified nucleic acid oligomer according to claim 70, wherein the charge transfer complex is a Ru(II), Cr(III), Fe(II), Os(II), or Co(II) complex.

72. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the modified nucleic acid oligomer can sequence-specifically bind single-strand DNA, RNA, and/or PNA.

73. (NEW) The modified nucleic acid oligomer according to claim 72, wherein the modified nucleic acid oligomer is a deoxyribonucleic acid oligomer, a ribonucleic acid oligomer, or a peptide nucleic acid oligomer.

74. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety is covalently bound to one of the phosphoric-acid groups, to one of the carboxylic-acid groups, to one of the amine groups, or to a sugar of the nucleic acid oligomer backbone.

75. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety is covalently bound to a sugar-hydroxy group of the nucleic acid oligomer backbone.

76. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety is covalently attached to a thiol group, a hydroxyl group, a carboxylic-acid group, or an amine group of a modified base of the nucleic acid oligomer.

77. (NEW) The modified nucleic acid oligomer according to claim 76, wherein the reactive thiol, hydroxyl, carboxylic-acid, or amine group of the base is covalently bound to the base via a branched or linear molecular moiety of any composition and chain length, the shortest continuous link between the thiol, hydroxyl, carboxylic-acid, or amine group and the base being a branched or linear molecular moiety having a chain length of 1-20 atoms.

78. (NEW) The modified nucleic acid oligomer according to claim 77, wherein the shortest continuous link between the thiol, hydroxyl, carboxylic-acid, or amine group and the base is a branched or linear molecular moiety having a chain length of 1-14 atoms.

79. (NEW) The modified nucleic acid oligomer according to claim 74, wherein the redox-active moiety is attached to an end of the nucleic acid oligomer backbone or to a terminal modified base..

80. (NEW) The modified nucleic acid oligomer according to claim 56, wherein the redox-active moiety is photoinducibly redox-active moiety..

81. (NEW) The modified nucleic acid oligomer according to claim 56, wherein, redox-active moiety is a chemically-inducibly redox-active moiety.

82. (NEW) The modified nucleic acid oligomer according to claim 56, wherein multiple redox-active moieties are attached to the nucleic acid oligomer.

83. (NEW) The method of producing a modified nucleic acid oligomer according to claim 56, wherein a redox-active moiety is covalently attached to a nucleic acid oligomer.

84. (NEW) The method of producing a modified nucleic acid oligomer according to claim 83, wherein the redox-active moiety is attached to a nucleic acid oligomer by covalently attaching at least one electron-donor molecule.

85. (NEW) The method of producing a modified nucleic acid oligomer according to claim 83, wherein the redox-active moiety is attached to a nucleic acid oligomer by covalently attaching at least one electron-acceptor molecule.

86. (NEW) The method of producing a modified nucleic acid oligomer according to claim 83, wherein the redox-active moiety is attached to a nucleic acid oligomer by covalently attaching at least one macromolecule or by covalently attaching at least one protein.

87. (NEW) The method of producing a modified nucleic acid oligomer according to claim 84, wherein the redox-active moiety is completed by adding at least one component selected from the group consisting of electron-acceptor molecules, electron-donor molecules, macromolecules, and proteins.

88. (NEW) The method of producing a modified nucleic acid oligomer according to claim 83, wherein the nucleic acid oligomer is bound to the redox-active moiety by one or more amidations with amine or acid groups of the redox-active moiety, by one or more esterifications with alcohol or acid groups of the redox-active moiety, by thioester formation with thioalcohol or acid groups of the redox-active moiety, or by condensation of one or more amine groups of the nucleic acid oligomer with aldehyde groups of the redox-active moiety and subsequent reduction of the resultant carbon-nitrogen double bond.

89. (NEW) The method of producing a modified nucleic acid oligomer according to claim 88, wherein at least one branched or linear molecular moiety of any composition and chain length is covalently attached to the redox-active moiety and the branched or linear molecular moiety has a reactive amine, hydroxyl, thiol, acid, or aldehyde group for covalent attachment to a nucleic acid oligomer.

90. (NEW) The method of producing a modified nucleic oligomer according to claim 89 wherein the shortest continuous link between the nucleic acid oligomer and the redox-active moiety is a branched or linear molecular moiety having a chain length of 1-20 atoms.

91. (NEW) The method of producing a modified nucleic acid oligomer according to claim 90, wherein the shortest continuous link between the nucleic acid oligomer and the redox-active moiety is a branched or linear molecular moiety having a chain length of 1-14 atoms.

92. (NEW) The modified conductive surface, wherein at least one type of modified nucleic acid oligomer according to claim 56, is attached to a conductive surface.

93. (NEW) The modified conductive surface according to claim 92, wherein the surface consists of a metal or a metal alloy.

94. (NEW) The modified conductive surface according to claim 93, wherein the surface consists of a metal selected from the group of metals consisting of platinum, palladium, gold, cadmium, mercury, nickel, zinc, carbon, silver, copper, iron, lead, aluminum, and manganese.

95. (NEW) The modified conductive surface according to claim 92, wherein the surface consists of a semiconductor.

96. (NEW) The modified conductive surface according to claim 92, wherein the surface consists of a semiconductor selected from the group comprising carbon, silicon, germanium, and tin.

97. (NEW) The modified conductive surface according to claim 84, wherein the surface consists of a binary compound of the elements of groups 14 and 16, a binary compound of the elements of groups 13 and 15, a binary compound of the elements of groups 15 and 16, or a binary compound of the elements of groups 11 and 17.

98. (NEW) The modified conductive surface according to claim 97, wherein the surface consists of a Cu(i) halide or an Ag(i) halide.

99. (NEW) A modified conductive surface according to claim 92, wherein the surface consists of a ternary compound of the elements of groups 11, 13, and 16, or a ternary compound of the elements of groups 12, 13, and 16.

100. (NEW) The modified conductive surface according to claim 92, wherein the attachment of the modified nucleic acid oligomers to the conductive surface occurs covalently or by chemisorption or physisorption.

101. (NEW) The modified conductive surface according to claim 92, wherein one of the phosphoric-acid, carboxylic-acid or amine groups or a sugar group of the nucleic acid oligomer backbone is attached, covalently or by chemisorption or physisorption, to the conductive surface.

102. (NEW) The modified conductive surface according to claim 101, wherein a sugar-hydroxyl group fo the nucleic acid oligomer backbone is attached, covalently or by chemisorption or physisorption, to the conductive surface.

103. (NEW) A modified conductive surface according to claim 92, wherein a thiol group, a hydroxyl group, a carboxylic-acid group, or an amine group of a modified base of the nucleic acid oligomer is attached, covalently or by chemisorption or physisorption, to the conductive surface.

104. (NEW) The modified conductive surface according to claim 101, wherein the modified nucleic acid oligomer is bound to the conductive surface via a group at the end of the nucleic acid oligomer backbone or via a group of a terminal, modified base.

105. (NEW) The modified conductive surface according to claim 92, wherein branched or linear molecular moieties of any composition and chain length are attached, covalently or by chemisorption or physisorption, to the conductive surface and the modified nucleic acid oligomers are covalently attached to these molecular moieties.

106. (NEW)) The modified conductive surface according to claim 105, wherein the shortest continuous link between the conductive surface and the nucleic acid oligomer is a branched or linear molecular moiety having a chain length of 1-20 atoms.

107. (NEW) The modified conductive surface according to claim 105, wherein the shortest continuous ink between the conductive surface and the nucleic acid oligomer is a branched or linear molecular moiety having a chain length of 1-12 atoms.

108. (NEW) The modified conductive surface according to claim 105, wherein the branched or linear molecular moiety is attached to a phosphoric-acid group, a carboxylic-acid group, an amine group, or a sugar group of the nucleic acid oligomer backbone or a thiol, hydroxyl, carboxylic-acid, or amine group of a modified base of the nucleic acid oligomer.

109. (NEW) The modified nucleic acid oligomer according to claim 108, wherein the branched or linear molecular moiety is attached of a sugar-hydroxyl group fo the nucleic acid oligomer backbone.

110. (NEW) The modified conductive surface according to claim 108, wherein the branched or linear molecular moiety is bound to a phosphoric-acid, sugar-hydroxy, carboxylic-acid, or amine group at the end of the nucleic acid oligomer backbone or to a thiol, hydroxyl, carboxylic acid, or amine group of a terminal, modified base.

111. (NEW) The modified conductive surface according to claim 92, wherein predominantly one type of modified nucleic acid oligomer each is attached in a spatially delimited area of the conductive surface.

112. (NEW) The modified conductive surface according to claim 111, wherein only one type of modified nucleic acid oligomer each is attached in a spatially delimited area of the conductive surface.

113. (NEW) The method of producing a modified conductive surface according to claim 92, wherein at least one type of modified nucleic acid oligomer is applied to a conductive surface.

114. (NEW) The method of producing a modified conductive surface according to claim 112, wherein at least one type of nucleic acid oligomer is applied to a conductive surface and, subsequently, a modification of the nucleic acid oligomers is carried out.

115. (NEW) The method of producing a modified conductive surface according to claim 113, wherein the nucleic acid oligomers or the modified nucleic acid oligomers are hybridized with the respective complementary nucleic acid oligomer strand and applied to the conductive surface in the form of the double-strand hybrid.

116. (NEW) The method of producing a modified conductive surface according to claim 113, wherein the nucleic acid oligomer or the modified nucleic acid oligomer is applied to the conductive surface in the presence of further chemical compounds that are likewise attached to the conductive surface.

117. (NEW) The method of electrochemically detecting oligomer hybridization events, wherein at least one modified conductive surface according to claim 92, is brought into contact with nucleic acid oligomers and, subsequently, detection of the electrical communication between the redox-active moiety and the conductive surface takes place.

118. (NEW) The method according to claim 117, wherein detection takes place by cyclic voltammetry, amperometry, or conductivity measurement.

119. (NEW) The method according to claim 117, wherein electrochemical detection is initiated by photoinduced charged separation in the photoinducibly redox-active moiety attached to the conductive surface via a nucleic acid oligomer.

120. (NEW) The method according to claim 119, wherein the light irradiation for photoinduced charge separation in the photoinducibly redox-active moiety attached to the conductive surface via a nucleic acid oligomer is limited to an area of the conductive surface having at least one type of modified nucleic acid oligomer.

121. (NEW) The method according to claim 119, wherein the photoinducibly redox-active moiety's oxidized electron-donor molecule resulting from irradiation with light of a specific or any given wavelength is rereduced by a suitable free redox-active substance that is not bound to but in contact with the nucleic acid oligomer, i.e. it is restored to the state it was originally in prior to light irradiation.

122. (NEW) The method according to claim 119, wherein the photoinducibly redox-active moiety's reduced electron-acceptor molecule resulting form irradiation with light of a specific or any given wavelength is reoxidized by a suitable free redox-active substance that is not bound to but in contact with the nucleic acid oligomer, i.e. it is restored to the state it was originally in prior to light irradiation.

123. (NEW) The method of electrochemical detection according to claim 117, wherein the electrochemical detection is facilitated by a free redox-active substance that effectuates a thermal charge transfer to the redox-active moiety.

124. (NEW) The method according to claim 122, wherein the free redox-active substance that is not bound to but in contact with the nucleic acid oligomer is selectively oxidizable and reducible at a potential φ, where φ satisfies the condition $2.0\ V \geq \varphi \geq -2.0\ V$, measured against normal hydrogen electrode.

125. (NEW) The method according to claim 121, wherein the free redox-active substance that is not bound to but in contact with the nucleic acid oligomer is a free quinone, a free hexacyanoferrate(II) complex, a free sodium ascorbate, a free Ru(II)hexamine complex, or a free redox-active protein

126. (NEW) The method according to claim 125, wherein the free redox-active substance that is not bound to but in contact with the nucleic acid oligomer is a free cytochrome.

106. (NEW) The method according to claim 105, wherein the light irradiation for photoinduced charge separation in the photoinducibly redox-active moiety attached to the conductive surface via a nucleic acid oligomer is limited to an area of the conductive surface having one or more modified nucleic acid oligomer types.

107. (NEW) The method according to claim 105, wherein the photoinducibly redox-active moiety's oxidized electron-donor molecule or reduced electron-acceptor molecule resulting from irradiation with light of a specific or any given wavelength is rereduced or reoxidized by a suitable free redox-active substance not bound to, but in contact with the nucleic acid oligomer, i.e. the oxidized electron-donor molecule or reduced electron-acceptor molecule is restored to the state it was originally in prior to light irradiation.

108. (NEW) The method of electrochemical detection according to claim 103, wherein the electrochemical detection is facilitated by a free redox-active substance that effectuates a chemically induced charge transfer to the redox-active moiety.

109. (NEW) The method according to claim 107, wherein the free redox-active substance not bound to but in contact with the nucleic acid oligomer is selectively oxidizable and reducible at a potential φ, where φ satisfies the condition $2.0\ V \geq \varphi \geq -2.0\ V$, measured against normal hydrogen electrode.

110. (NEW) The method according to claim 107, wherein the free redox-active substance not bound to but in contact with the nucleic acid oligomer is a free quinone, a free hexacyanoferrate(II) complex, a free sodium ascorbate, a free Ru(II)hexamine complex, or a free redox-active protein, especially a free cytochrome.